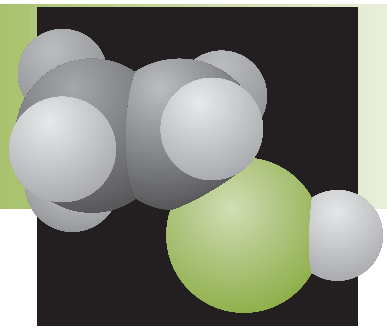
CHEMICALS
Project Fact Sheet



Production of Chemicals from Thermoset Plastics

Benefits

- Reduction of 2.1 million tons in annual carbon dioxide emissions
- Decrease of 1.6 million tons of solid waste production per year
- Annual energy savings of 44 trillion Btu by 2020
- Recovery of relatively high-value chemicals worth $0.80 to $1.80 per pound
- Decrease in use of fossil energy resources to produce chemicals

Applications

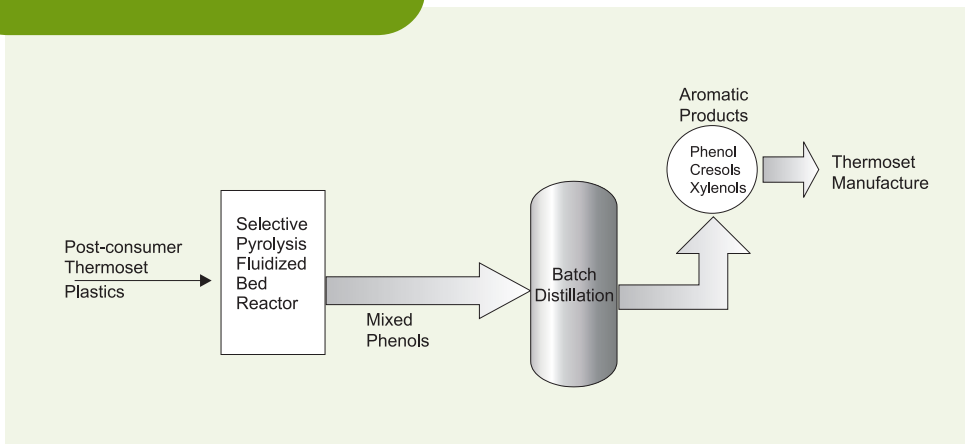
The new technology will be used by the chemical industry to obtain monomers of significant value from discarded thermoset plastics. Achieving recycle capability for thermosets will enhance their ability to compete with currently recycled thermoplastic resins (e.g., acrylics, polyethylene, styrene, nylon).

Aromatic Monomers Can Be Recovered from Waste Plastics

Researchers have developed methods for recovering valuable chemicals from thermoset plastics such as novolacs, cross-linked polyesters, epoxies, and polyarylates, as well as blends of these compounds. These plastics are used in the manufacture of composites for automotive components, electronics, and other consumer products. Thermoset plastics cannot be remelted or remolded without destroying their original properties, and thus cannot be recycled using traditional methods. Combustion of these plastics or grinding for use as fillers has little economic or energy value, and most wind up in landfills after they are discarded.

Currently thermosets must be manufactured from aromatic monomers that are derived from petroleum using very energy-intensive processes. The new technology, which is based on selective pyrolysis, will permit recovery of the original monomers from discarded thermoset products. The chemicals recovered will provide valuable feedstocks for thermoset production and reduce requirements for monomers produced by energy-intensive processes. Achieving recycle capability for thermosets will enhance their ability to compete with currently recyclable thermoplastic resins (e.g., polyethylene, acrylics, nylon) and reduce the amount of solid waste going to already crowded landfills.

Chemicals from Thermosets



Fast, selective pyrolysis of thermosets in a fluidized bed produces a mixture of aromatic chemicals that can be easily separated and used as feedstocks.

Project Description

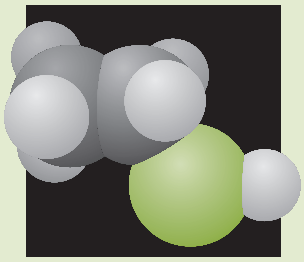
Goal: To develop a procedure for recovering value-added chemicals from thermoset plastics.

Since 1996, investigators have examined the relationship between more than 25 novolac plastics and the type of phenolic monomers produced by selective fast pyrolysis. A reactive atmosphere is used as part of the fluidizing gas in a standard fluidized bed reactor. The atmosphere captures radical species produced in the reactor, particularly aromatic phenols. The majority of the phenolic chemicals generated are valuable, substituted phenols, and the methods developed require minimal pre-process separation or post-reaction purification.

By the end of 1998, work will be completed on validating the technology in a 4-inch, continuously fed, fluidized bed reactor. The product will be tested by Merichem Corporation for use as a feedstock in standard-batch distillation. A technology/economic assessment will be conducted and the technology will then be demonstrated in a pilot plant.

Progress and Milestones

- Phenol, cresol, and xylenol have been produced from plastics using fast pyrolysis.
- A better understanding was gained of the proper operating conditions for novolac pyrolysis.
- Reactive pyrolysis was found to control the composition of the products produced.
- The process is cost-effective because no expensive catalyst is needed.
- Successful commercialization is anticipated because of early participation (during the developmental stage) of a feedstock supplier, a product manufacturer, and a customer for products.



Project Partners

Members of Phenolics Division of Society of Plastics Engineers

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February 1999